

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TD62001P, TD62001AP, TD62001F, TD62001AF, TD62002P, TD62002AP, TD62002F  
TD62002AF, TD62003P, TD62003AP, TD62003F, TD62003AF, TD62004P, TD62004AP  
TD62004F, TD62004AF

## 7CH DARLINGTON SINK DRIVER

The TD62001P/AP/F/AF Series are high-voltage, high-current darlington drivers comprised of seven NPN darlington pairs.

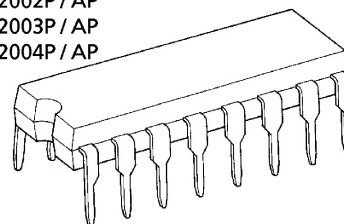
All units feature integral clamp diodes for switching inductive loads.

Applications include relay, hammer, lamp and display (LED) drivers.

### FEATURES

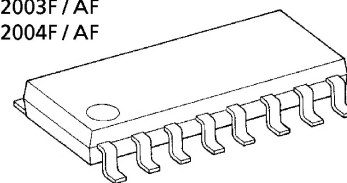
- Output current (single output) 500mA MAX.
- High sustaining voltage output  
35V MIN. (TD62001P/F Series)  
50V MIN. (TD62001AP/AF Series)
- Output clamp diodes
- Inputs compatible with various types of logic
- Package Type-P, AP : DIP-16pin
- Package Type-F, AF : SOP-16pin

TD62001P / AP  
TD62002P / AP  
TD62003P / AP  
TD62004P / AP



DIP16-P-300-2.54A

TD62001F / AF  
TD62002F / AF  
TD62003F / AF  
TD62004F / AF



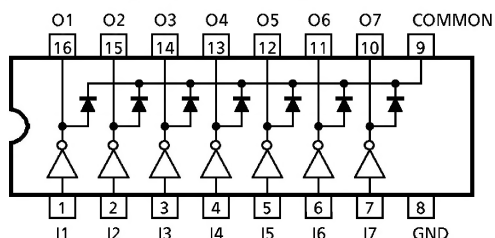
SOP16-P-225-1.27

Weight

DIP16-P-300-2.54A : 1.11g (Typ.)  
SOP16-P-225-1.27 : 0.16g (Typ.)

TYPE	INPUT BASE RESISTOR	DESIGNATION
TD62001P / AP / F / AF	External	General Purpose
TD62002P / AP / F / AF	10.5-k $\Omega$ + 7V Zener diode	14~25V PMOS
TD62003P / AP / F / AF	2.7k $\Omega$	TTL, 5V CMOS
TD62004P / AP / F / AF	10.5k $\Omega$	6~15V PMOS, CMOS

### PIN CONNECTION (TOP VIEW)

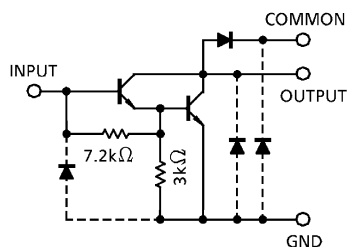


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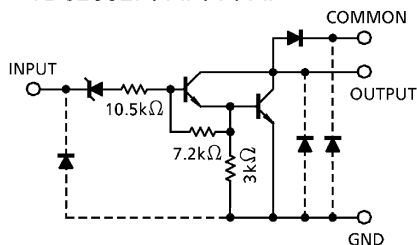
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**SCHEMATICS (EACH DRIVER)**

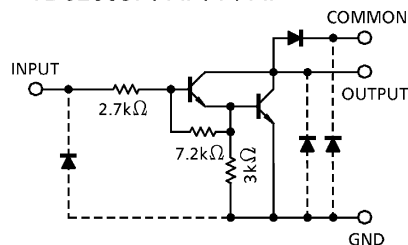
TD62001P / AP / F / AF



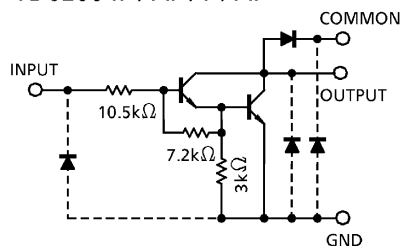
TD62002P / AP / F / AF



TD62003P / AP / F / AF



TD62004P / AP / F / AF



(Note) The input and output parasitic diodes cannot be used as clamp diodes.

**MAXIMUM RATINGS (Ta = 25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT
Output Sustaining Voltage	P, F	$V_{CE(SUS)}$	- 0.5~35	V
	AP, AF		- 0.5~50	
Output Current		$I_{OUT}$	500	mA / ch
Input Voltage		$V_{IN}$ (Note 1)	- 0.5~30	V
Input Current		$I_{IN}$ (Note 2)	25	mA
Clamp Diode Reverse Voltage	P, F	$V_R$	35	V
	AP, AF		50	
Clamp Diode Forward Current		$I_F$	500	mA
Power Dissipation	P	$P_D$	1.0	W
	AP		1.47	
	F, AF		0.54 / 0.625 (Note 3)	
Operating Temperature	P	$T_{opr}$	- 30~75	°C
	AP, F, AF		- 40~85	
Storage Temperature		$T_{stg}$	- 55~150	°C

(Note 1) Except TD62001P / AP / F / AF

(Note 2) Only TD62001P / AP / F / AF

(Note 3) On glass epoxy PCB (30×30×1.6mm Cu 50%)

**RECOMMENDED OPERATING CONDITIONS** ( $T_a = -40\sim 85^\circ\text{C}$  and  $T_a = -30\sim 75^\circ\text{C}$  for only Type-P)

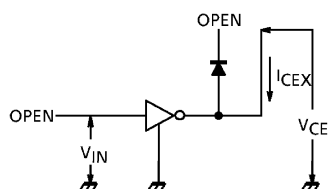
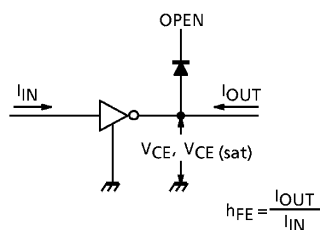
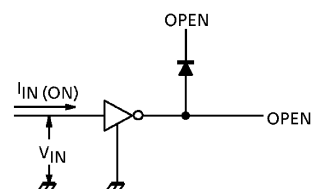
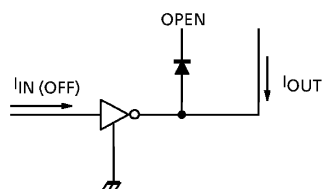
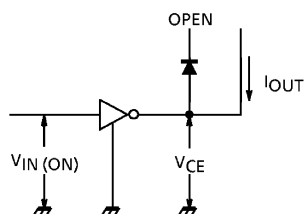
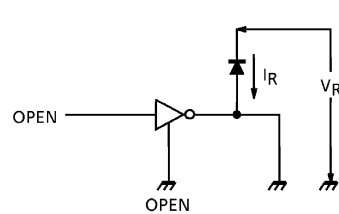
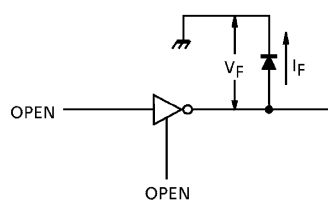
CHARACTERISTIC		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Sustaining Voltage	P, F	$V_{CE(SUS)}$			0	—	35	V
	AP, AF				0	—	50	
Output Current	AP	$I_{OUT}$	$T_{pw} = 25\text{ms}$ 7 Circuits $T_a = 85^\circ\text{C}$ $T_j = 120^\circ\text{C}$	Duty = 10%	0	—	370	mA / ch
				Duty = 50%	0	—	130	
	P			Duty = 10%	0	—	295	
				Duty = 50%	0	—	95	
	F, AF			Duty = 10%	0	—	233	
				Duty = 50%	0	—	70	
Input Voltage	Except TD62001P / AP / F / AF	$V_{IN}$			0	—	24	V
Input Voltage (Output On)	TD62002	$V_{IN(ON)}$	$I_{OUT} = 400\text{mA}$ $h_{FE} = 800$		14.5	—	24	V
	TD62003				2.8	—	24	
	TD62004				6.2	—	24	
Input Voltage (Output Off)	TD62001	$V_{IN(OFF)}$			0	—	0.6	V
	TD62002				0	—	7.4	
	TD62003				0	—	0.7	
	TD62004				0	—	1.0	
Input Current	Only TD62001	$I_{IN}$			0	—	10	mA
Clamp Diode Reverse Voltage	P, F	$V_R$			—	—	35	V
	AP, AF				—	—	50	
Clamp Diode Forward Current		$I_F$			—	—	350	mA
Power Dissipation	P	$P_D$	$T_a = 85^\circ\text{C}$		—	—	0.6	W
	AP				—	—	0.76	
	AF, F		(Note) $T_a = 85^\circ\text{C}$		—	—	0.325	

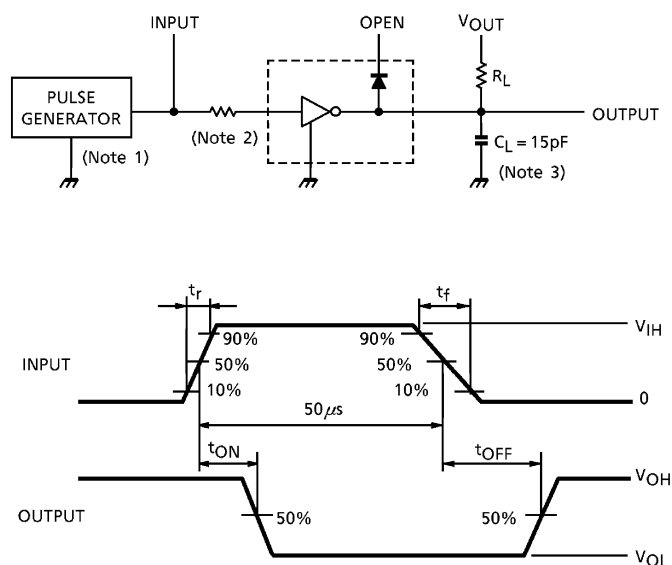
(Note) On glass epoxy PCB (30×30×1.6mm Cu 50%)

## ELECTRICAL CHARACTERISTICS (Ta = 25°C unless otherwise noted)

CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT			
Output Leakage Current	AP, AF	I <sub>CEX</sub>	1	V <sub>CE</sub> = 50V, Ta = 25°C		—	—	50	μA			
	V <sub>CE</sub> = 50V, Ta = 85°C			—	—	100						
	F			V <sub>CE</sub> = 35V, Ta = 25°C		—	—	50				
				V <sub>CE</sub> = 35V, Ta = 85°C		—	—	100				
	P			V <sub>CE</sub> = 35V, Ta = 25°C		—	—	50				
				V <sub>CE</sub> = 35V, Ta = 75°C		—	—	100				
Collector-Emitter Saturation Voltage		V <sub>CE (sat)</sub>	2	I <sub>OUT</sub> = 350mA, I <sub>IN</sub> = 500μA		—	1.3	1.6	V			
				I <sub>OUT</sub> = 200mA, I <sub>IN</sub> = 350μA		—	1.1	1.3				
				I <sub>OUT</sub> = 100mA, I <sub>IN</sub> = 250μA		—	0.9	1.1				
DC Current Transfer Ratio		h <sub>FE</sub>	2	V <sub>CE</sub> = 2V, I <sub>OUT</sub> = 350mA		1000	—	—				
Input Current (Output On)	TD62002	I <sub>IN (ON)</sub>	3	V <sub>IN</sub> = 20V, I <sub>OUT</sub> = 350mA		—	1.1	1.7	mA			
	TD62003			V <sub>IN</sub> = 2.4V, I <sub>OUT</sub> = 350mA		—	0.4	0.7				
	TD62004			V <sub>IN</sub> = 9.5V, I <sub>OUT</sub> = 350mA		—	0.8	1.2				
Input Current (Output Off)	P	I <sub>IN (OFF)</sub>	4	I <sub>OUT</sub> = 500μA, Ta = 75°C		50	65	—	μA			
	AP, F, AF			I <sub>OUT</sub> = 500μA, Ta = 85°C		50	65	—				
Input Voltage (Output On)	TD62002	V <sub>IN (ON)</sub>	5	V <sub>CE</sub> = 2V h <sub>FE</sub> = 800	I <sub>OUT</sub> = 350mA	—	—	13.7	V			
	I <sub>OUT</sub> = 200mA				—	—	11.4					
	TD62003				I <sub>OUT</sub> = 350mA					—	—	2.6
					I <sub>OUT</sub> = 200mA					—	—	2.0
	TD62004				I <sub>OUT</sub> = 350mA					—	—	4.7
					I <sub>OUT</sub> = 200mA					—	—	4.4
Clamp Diode Reverse Current	AP, AF	I <sub>R</sub>	6	V <sub>R</sub> = 50V, Ta = 25°C		—	—	50	μA			
	V <sub>R</sub> = 50V, Ta = 85°C			—	—	100						
	F			V <sub>R</sub> = 35V, Ta = 25°C		—	—	50				
				V <sub>R</sub> = 35V, Ta = 85°C		—	—	100				
	P			V <sub>R</sub> = 35V, Ta = 25°C		—	—	50				
				V <sub>R</sub> = 35V, Ta = 75°C		—	—	100				
Clamp Diode Forward Voltage		V <sub>F</sub>	7	I <sub>F</sub> = 350mA		—	—	2.0	V			
Input Capacitance		C <sub>IN</sub>	—			—	15	—	pF			
Turn-On Delay	P, F	t <sub>ON</sub>	8	V <sub>OUT</sub> = 35V, R <sub>L</sub> = 87.5Ω C <sub>L</sub> = 15pF		—	0.1	—	μs			
	AP, AF			V <sub>OUT</sub> = 50V, R <sub>L</sub> = 125Ω C <sub>L</sub> = 15pF		—	0.1	—				
Turn-Off Delay	P, F	t <sub>OFF</sub>	8	V <sub>OUT</sub> = 35V, R <sub>L</sub> = 87.5Ω C <sub>L</sub> = 15pF		—	0.2	—				
	AP, AF			V <sub>OUT</sub> = 50V, R <sub>L</sub> = 125Ω C <sub>L</sub> = 15pF		—	0.2	—				

**TEST CIRCUIT**

 1.  $I_{CEX}$ 

 2.  $V_{CE(sat)}$ ,  $h_{FE}$ 

 3.  $I_{IN(ON)}$ 

 4.  $I_{IN(OFF)}$ 

 5.  $V_{IN(ON)}$ 

 6.  $I_R$ 

 7.  $V_F$ 


8.  $t_{ON}$ ,  $t_{OFF}$ 


(Note 1) Pulse width  $50\mu\text{s}$ , duty cycle 10%  
Output impedance  $50\Omega$ ,  $t_r \leq 5\text{ns}$ ,  $t_f \leq 10\text{ns}$

(Note 2) See below

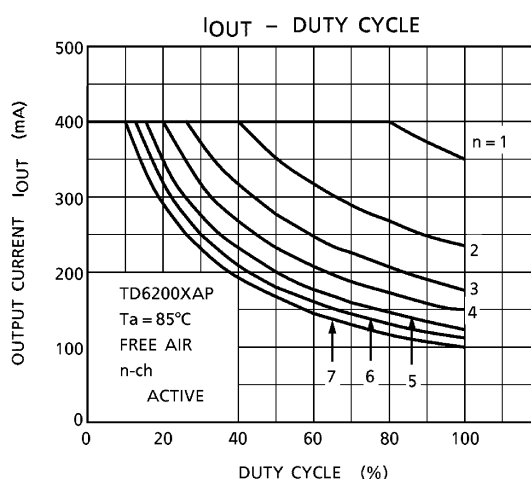
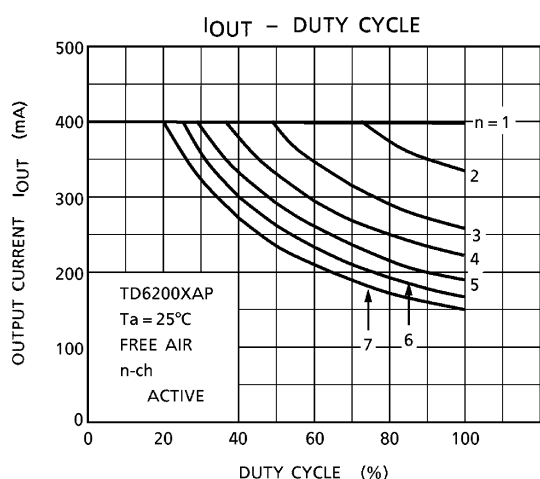
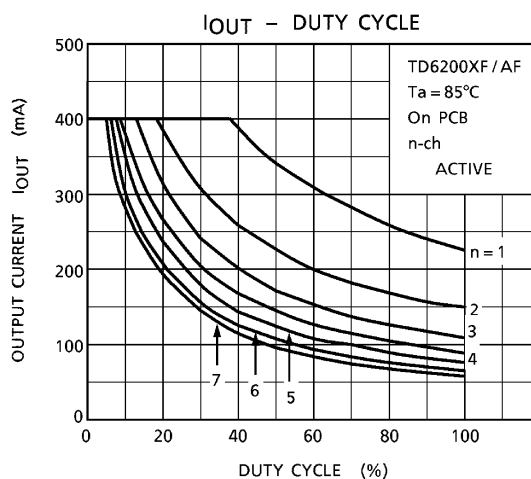
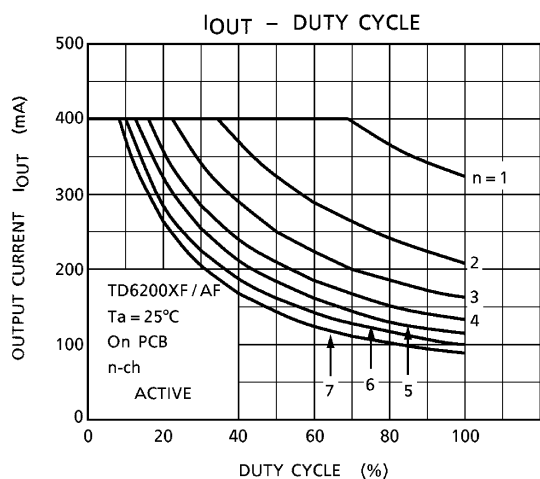
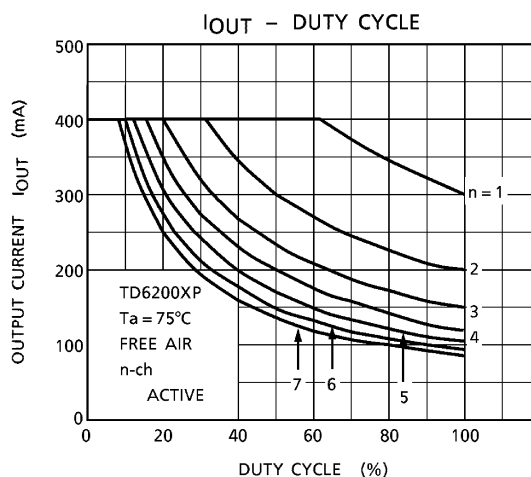
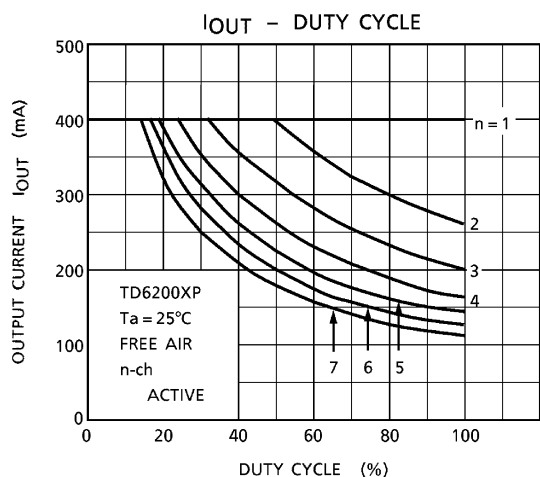
## INPUT CONDITION

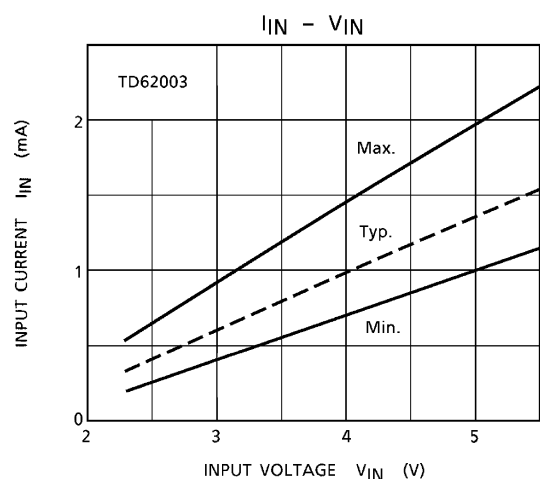
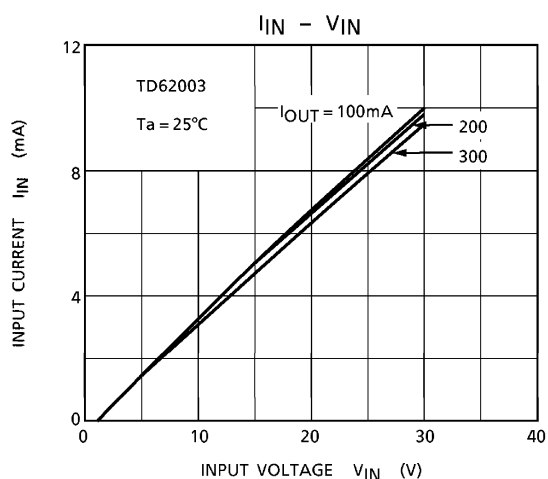
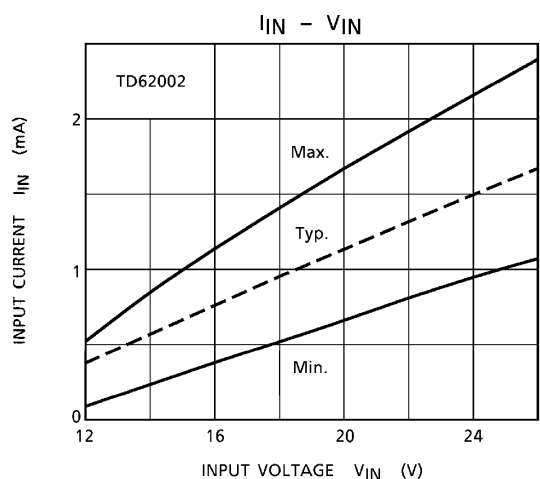
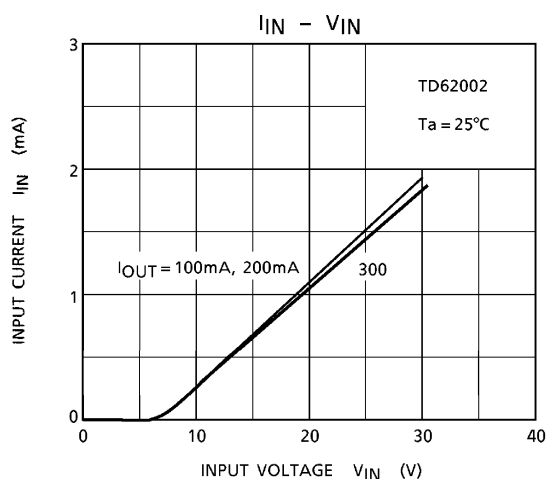
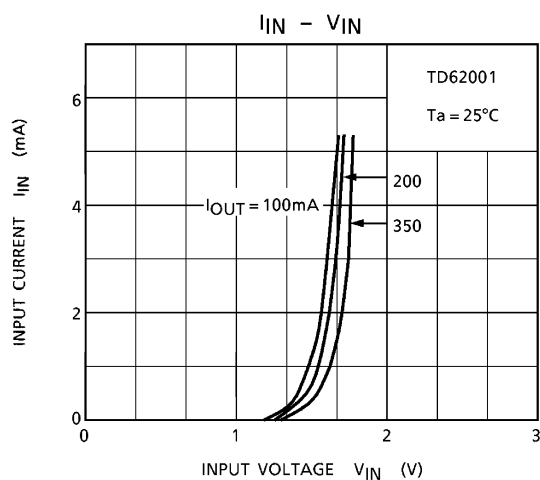
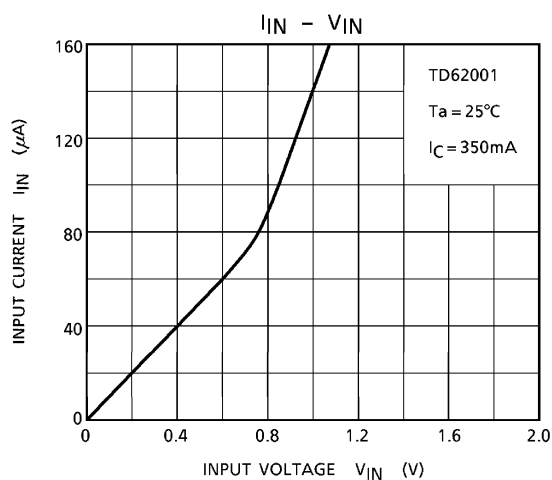
TYPE NUMBER	R1	$V_{IH}$
TD62001P / AP / F / AF	$2.7\text{k}\Omega$	3V
TD62002P / AP / F / AF	0	13V
TD62003P / AP / F / AF	0	3V
TD62004P / AP / F / AF	0	8V

(Note 3)  $C_L$  includes probe and jig capacitance.

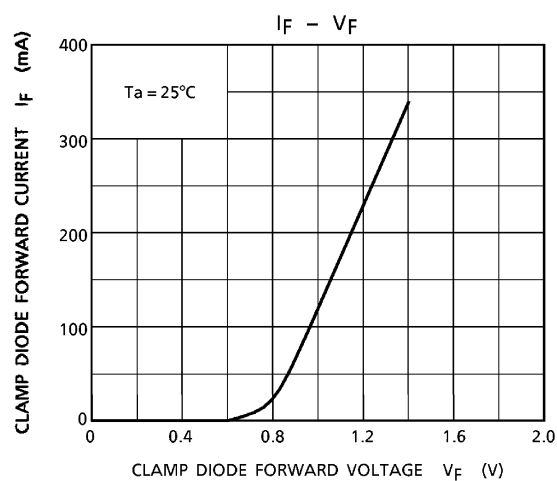
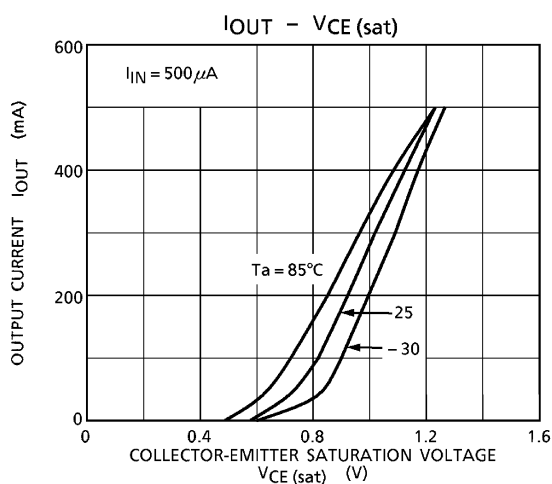
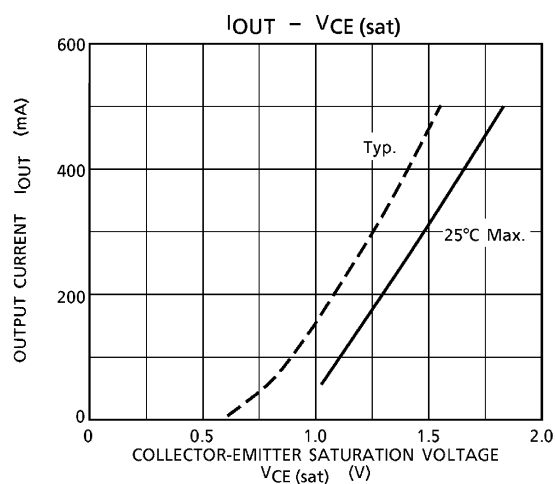
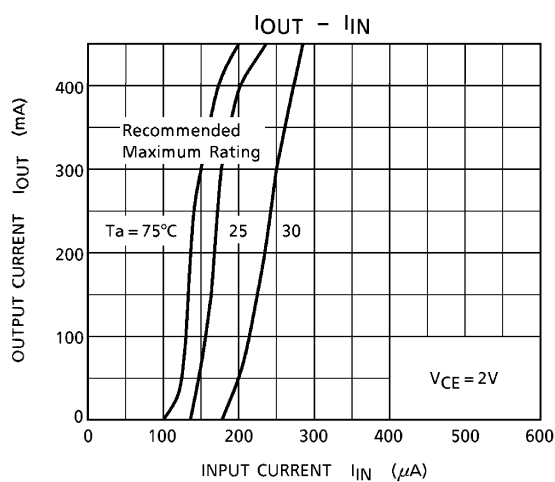
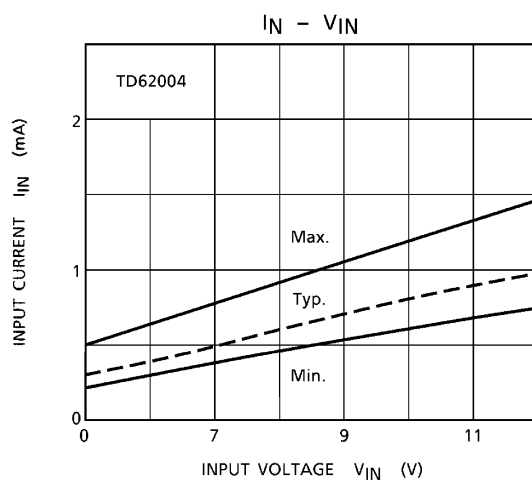
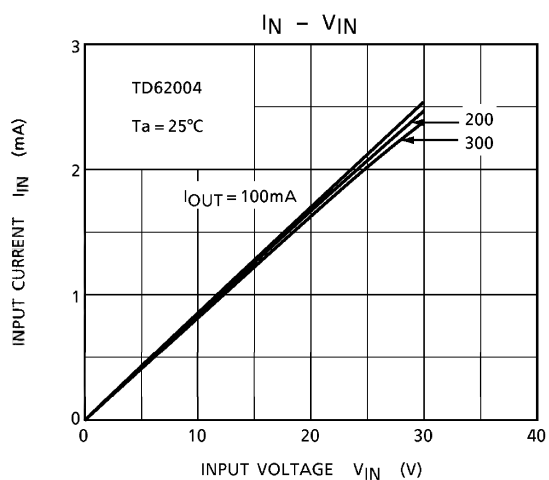
## PRECAUTIONS for USING

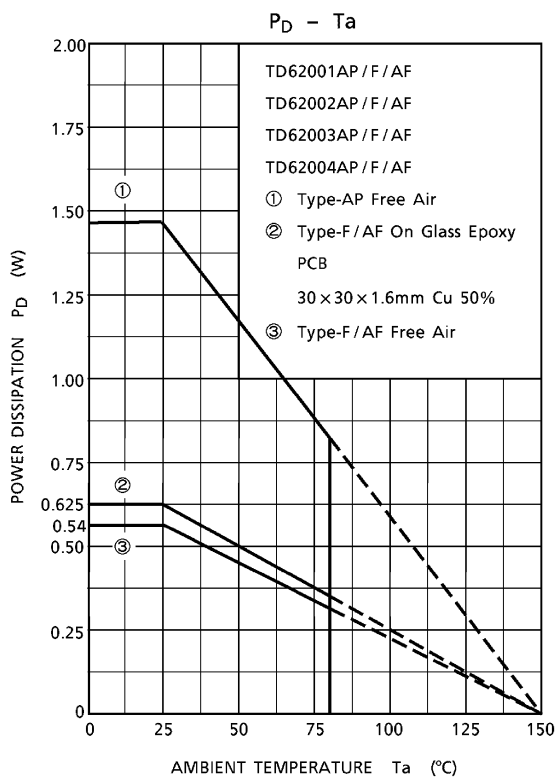
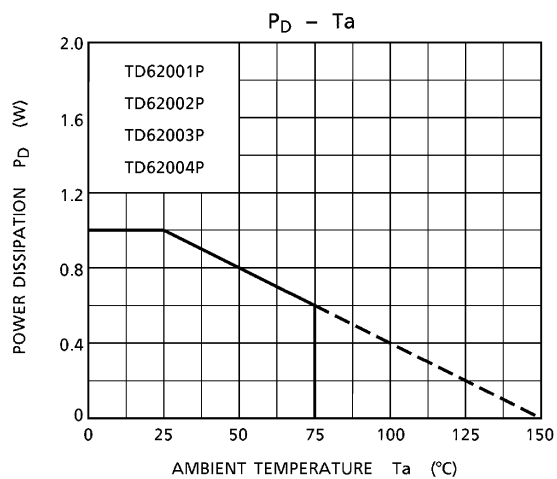
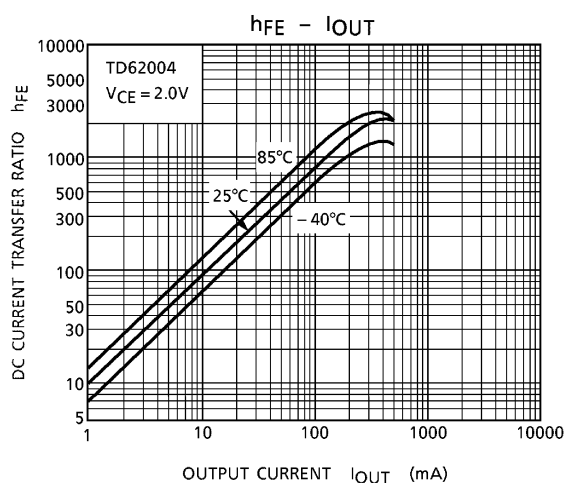
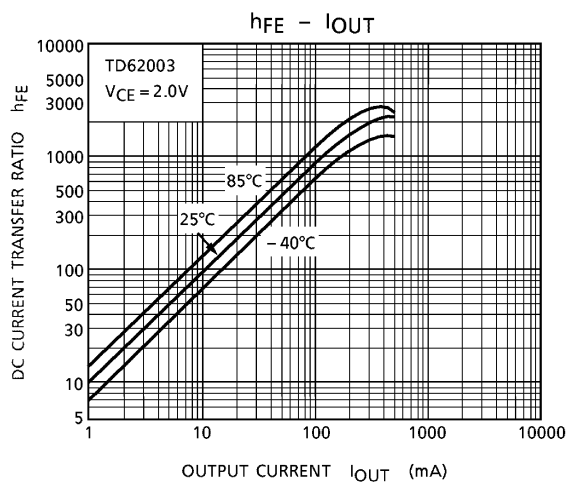
Utmost care is necessary in the design of the output line, COMMON and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.







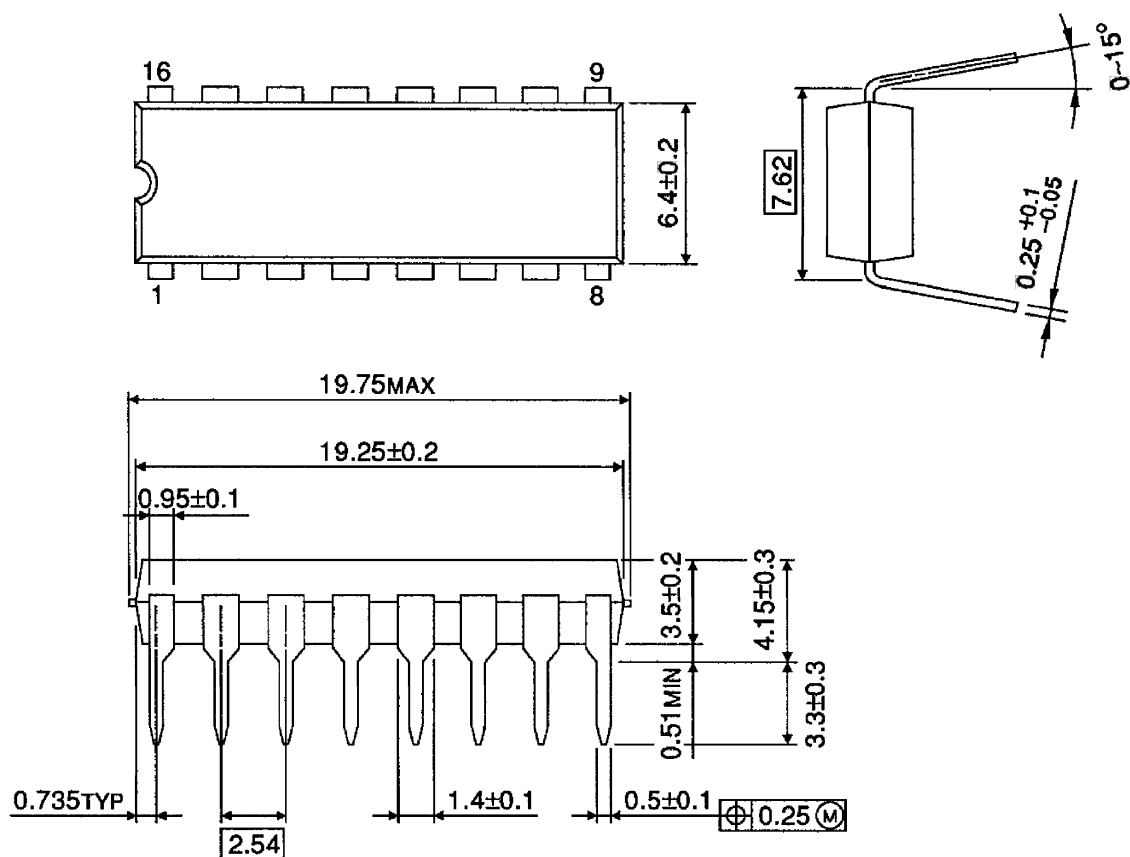




## OUTLINE DRAWING

DIP16-P-300-2.54A

Unit : mm

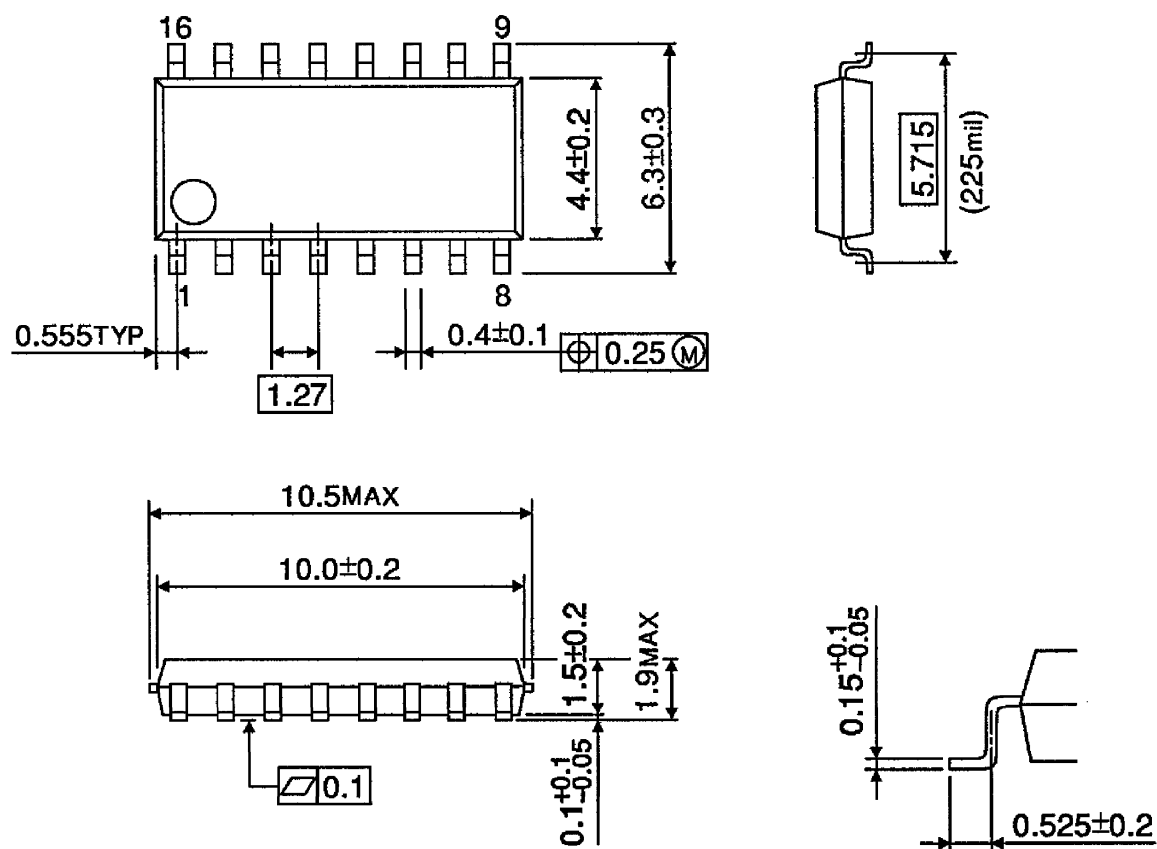


Weight : 1.11g (Typ.)

**OUTLINE DRAWING**

SOP16-P-225-1.27

Unit : mm



Weight : 0.16g (Typ.)